Cross-cultural generalizability of the ICD-11 PGD symptom network: Identification of central symptoms and culturally specific items across German-speaking and Chinese bereaved

Stelzer, Eva-Maria ; Höltge, Jan ; Zhou, Ningning ; Maercker, Andreas ; Killikelly, Clare

Abstract: Background: Prolonged grief disorder (PGD) is a newcomer to psychopathology and the new ICD-11 diagnostic criteria are conceptualized with an eye towards global applicability. Yet, previous network studies have not used official ICD-11 criteria nor tested whether network structures generalize across cultural groups even though much current research relies on ICD-11 PGD criteria. Methods: To overcome these limitations, the present study used data from 539 German-speaking (n = 214) and Chinese (n = 325) bereaved individuals to investigate similarities and differences in network structures of ICD-11 PGD criteria. In addition, network structures were investigated for an expanded supplementary questionnaire of culturally-bound grief symptoms hypothesized to be of relevance in each cultural context. Results: Results suggested both similarities and differences in network structures between the two samples. Across cultural groups, intense feelings of sorrow and inability to experience joy or satisfaction since the death emerged as most central symptoms. Compared to the standard PGD network, the expanded network showed a better average predictability for Chinese participants, but no improvement for the German-speaking context. Unhealthy behavior change was the most central symptom for Chinese bereaved when additional grief symptoms were included. Conclucions: Results of the present study suggest there are culturally-bound symptoms of grief which are not included in the current ICD-11 PGD criteria. These findings provide areas of special clinical attention concerning screening and treatment and present a first step towards a more cultural-sensitive understanding of grief. Clinical trials: NCT03568955.

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Eva-Maria Stelzer [a,b,*], Jan Höltge [c], Ningning Zhou [a,d], Andreas Maercker [a], Clare Killikelly [a]

[a] Department of Psychology, University of Zurich, Binzmuehlestrasse 14/17, CH-8050 Zurich, Switzerland
[b] Department of Psychology, University of Arizona, 1503 E. University Blvd, Tucson, AZ 85721, United States
[c] Resilience Research Centre, Dalhousie University, Halifax, Canada
[d] The School of Psychology and Cognitive Science, East China Normal University, Shanghai 200062, PR China

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ABSTRACT

Background: Prolonged grief disorder (PGD) is a newcomer to psychopathology and the new ICD-11 diagnostic criteria are conceptualized with an eye towards global applicability. Yet, previous network studies have not used official ICD-11 criteria nor tested whether network structures generalize across cultural groups even though much current research relies on ICD-11 PGD criteria.
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1. Introduction

After the death of someone close, an individual may experience a variety of grief reactions. These may be affective, cognitive, somatic and behavioral in nature [48]. For a majority of individuals, the severity and intensity of initial grief dissipates with time, however, for a small but important minority grief may become so severe it is classified as prolonged grief disorder (PGD) [30]. PGD is a new disorder included in the World Health Organization's (WHO) latest International Classifications of Diseases (ICD-11) and is defined by core symptoms of yearning or intense preoccupation with the deceased, accessory symptoms including examples of emotional pain, functional impairment and the violation of cultural norms [34,49] (see Table 1). These new PGD disorder guidelines were refined based on previously validated PGD criteria [37], with up to date expert consensus and through an international field trial [25,27]. However, how PGD is conceptualized by interactions between the new ICD-11 PGD symptoms, and if there exists a symptom network of PGD based on the ICD-11 symptoms that is representative of PGD in different cultures has yet to be empirically investigated. This has raised some important concerns from the field [10] that may be answered through robust empirical investigation.

A new innovative statistical technique, network analysis (NA), can be applied to map relations between individual symptoms of a disorder. The network approach conceptualizes disorders as a reflection of the relationships between symptoms instead of seeing symptoms as independent of each other and representing a latent underlying construct [39]. NA has recently gained popularity in psychopathological research by providing a different approach to design interventions (e.g., PGD: [9];

* Corresponding author at: Department of Psychology, University of Zurich, Binzmuehlestrasse 14/17, CH-8050 Zurich, Switzerland.
E-mail address: stelzeea@email.arizona.edu (E.-M. Stelzer).

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Table 1
ICD-11 Prolonged Grief Disorder diagnostic criteria (World Health Organization, 2018).

Criterion A: At least one of the following after the death of a close other	1. Persistent and pervasive longing for the deceased or 2. Persistent and pervasive preoccupation with the deceased
Criterion B: Examples of intense emotional pain	Accompanied by intense emotional pain e.g. sadness, guilt, anger, denial, blame, difficulty accepting the death, feeling one has lost a part of one's self, an inability to experience positive mood, emotional numbness, difficulty in engaging with social or other activities
Criterion C: Time, impairment and violation of cultural norms criterion	Grief response has persisted for an atypically long period of time (more than 6 months at a minimum); following the loss, grief response clearly exceeds expected social, cultural or religious norms for the individual's culture and context. Grief reactions that have persisted for longer periods that are within a normative period of grieving given the person's cultural and religious context are viewed as normal bereavement responses and are not assigned a diagnosis. The disturbance causes significant impairment in personal, family, social, educational, occupational or other important areas of functioning.

posttraumatic stress disorder: [17]; depression: [18]). Instead of identifying and treating the most prevalent and severe symptoms, NA can be used to identify symptoms that show relatively many and strong associations with other symptoms, which are called central symptoms [7]. Treating such symptoms is thought to likely affect other symptoms within the syndrome network and should therefore be targeted in interventions for a high efficiency. Next to identifying these central symptoms, NA is used to look at selected symptom relations for a better understanding of how a syndrome works (which symptoms are connected and influence each other) and develops (which symptom is likely to develop first because of the loss of a significant other; [15]). These networks can be compared across social contexts (e.g., countries, cultures) to investigate common and differential network characteristics [17]. We aim to use this technique to (1) identify the symptoms with the most and strongest associations to other symptoms (i.e., central symptoms) within the standard PGD syndrome network in two culturally different contexts, (2) investigate if the current ICD-11 items cover all cross-culturally relevant PGD symptoms or if additional, culture-specific symptoms should be added, and (3) to explore if the ICD-11 PGD network is generalizable across cultures.

Recently researchers have called into question the validity of the structure and content of the ICD-11 PGD guidelines. Yearning has long been considered a hallmark symptom of disordered grief [37,40]. Prigerson et al. [37] conducted an item response theory analysis and found that yearning was the most common symptom of PGD. Additionally, yearning is purported to be a core symptom as it most clearly distinguishes PGD from other disorders such as depression [42]. However, new research has shown that although yearning is highly endorsed, symptoms of emotional pain may be more representative core items of PGD [39]. Robinaugh et al. [39] conducted a NA on Persistent Complex Bereavement Disorder (PCBD) and found that emotional pain was the most central symptom in the network. A strong link between yearning and emotional pain was confirmed by Maccallum, Malgaroli, and Bonanno [32] across two samples. The emotional pain criteria, on the other hand, have also been criticized as lacking specificity [3,5]. Researchers have purported that the emotional pain criteria (i.e. for ICD-11 an individual must endorse at least one example of emotional pain) are too general and inclusive and may lead to overdiagnosis. Indeed, empirical reports have found higher prevalence rates using the ICD-11 criteria compared to other diagnostic guidelines such as DSM-5 PCBD or PGD_{PLOS} criteria [2,36]. For example, in a sample of 512 bereaved, the prevalence of probable DSM-5 PCBD (whereby 5 of 9 symptoms of emotional pain must be endorsed) was 6.4% compared to18.0% for ICD-11 PGD in the same sample. In order to enhance specificity of ICD-11 PGD, the current study seeks to explore which symptoms, in particular those pertaining to emotional pain and yearning, are most central to PGD so as to develop guidance for more specific diagnostic criteria.

A key remit of the revised ICD-11 was to improve the global applicability of the disorder definitions. Presently, few studies have explored past or current PGD symptom criteria outside of North America and Europe, although a new wave of research from Asia is bringing insight into the worldwide nature of PGD [23,46,51]. The validity of the ICD-11 PGD items in different cultures has yet to be determined. A study by Xiu et al. [50] found that although both German-speaking and Chinese participants had similar symptom profiles, German-speaking individuals expressed more preoccupation with the deceased whereas Chinese individuals endorsed more accessory symptoms of emotional pain and impairments. This attests to the phenomenon that different cultural groups may systematically endorse different grief symptoms therefore yielding different symptom prevalence rates [28,41]. Indeed, recently researchers have noted higher prevalence rates for disordered grief in Asian samples (see [46]). This could be because the current grief measurements are developed in North American and European contexts and do not take into account culturally relevant symptoms of grief that would more validly capture distress. For example, several researchers have found that Chinese bereaved may report somatic symptoms (i.e. headache, stomach, back pain) and none of these items are included in the ICD-11 guidelines [24]. Recently, NA was conducted cross-culturally and confirmed the generalizability of posttraumatic stress disorder across multiple samples [17]. To build on this study and provide more insight into the symptom profile of PGD in German-speaking and Chinese participants, we developed a new ICD-11 PGD scale with two parts (standard scale and cultural supplement scale; see Table 3). The first part is the standard scale which represents the ICD-11 PGD criteria (12 items) and the second part is the cultural supplement which includes a range of diverse culturally relevant items (19 additional items) derived from key informant interviews with German-speaking and Chinese health care workers and bereavement experts [47]. By comparing the symptom associations and central symptoms of the *standard scale* and the *supplementary scale* across two cultures, we seek to explore the value of adding culturally relevant items to the network and to establish the generalizability of ICD-11 PGD networks. This current study builds on previous NAs of disordered grief but is the first to use the new ICD-11 PGD criteria to investigate the similarities and differences of a PGD-symptom network between two different cultural groups using both a standard scale and expanded culturally adapted items.

Using NA, this study has three main aims. First, to identify which symptoms of ICD-11 PGD are most central particularly in terms of accessory symptoms of emotional pain. The second is to explore if any of the culturally relevant supplementary items enhance the network of PGD symptoms for either the German-speaking or Chinese bereaved. The third aim is to compare the network structure of ICD-11 PGD symptoms across two samples German-speaking and Chinese bereaved individuals to explore the generalizability of ICD-11 PGD networks.

2. Methods

2.1. Recruitment and procedure

A convenience sample of community-dwelling German-speaking and Chinese bereaved adults was recruited to participate in an online

survey exploring the similarities and differences in grief reactions crossculturally. German-speaking participants were recruited within Germany, Austria as well as the German-speaking part of Switzerland. Chinese participants were recruited in China only. In order to participate in the study, adults needed to have experienced the death of a loved one in the past 10 years. They had to be above 18 years, not suffer from current serious mental health disorders (e.g., schizophrenia, suicide risk), and not undergo any current mental health treatment or participate in grief therapy. Multiple recruitment pathways were used including electronic and print media advertisements (e.g., flyers, posters), community institution referrals (e.g., bereavement organizations or grief support groups who shared the study information with their members), community outreach, and University listservs. The online survey was administered using Qualtrics Survey Software. At the beginning of the survey, participants received information about the study procedures and its risks and benefits (e.g. study aims, advantages and disadvantages of participation, data handling). All participants provided written informed consent prior to study participation. Data were collected from May through July 2019. Ethical approval for this study was obtained from local ethical review boards.

2.2. Participants

The present study includes data from 539 participants who completed at least 50% of the survey. 214 participants completed the survey in German and 325 completed the survey in Chinese. The German-speaking sample was predominantly female (83%), middle-aged ($M = 38.71$, $SD = 16.02$), and relatively highly educated with 43% having completed college or university (see Table 2). Most German-speaking participants lost a grandparent (22%) or parent (21.5%), due to natural causes (72%), on average approximately four years ago ($M = 47.67$ months, $SD = 52.52$ months), and perceived the loss as comparatively unexpected ($M = 3.64$, $SD = 2.34$). The Chinese sample also primarily consisted of middle-aged ($M = 33.14$, $SD = 12.30$) women (66%) who were highly educated (80% college or university). Most Chinese participants experienced the death of grandparents (44%) or parents (29%), due to natural causes (86%), on average approximately four and a half years ago ($M = 55.18$ months, $SD = 46.27$ months), and considered the death as relatively unexpected ($M = 3.53$, $SD = 2.28$). German-speaking and Chinese participants differed significantly with regard to many sociodemographic or loss-related characteristics (see Table 2).

2.3. Measures

In the following, we describe the measure pertinent to the present analyses. For an exhaustive list of self-report measures collected in the present study, please see clinicaltrials.gov.

2.3.1. Prolonged grief symptoms

Symptoms of prolonged grief were assessed with the International Prolonged Grief Disorder Scale (IPGDS) [29]. In its core part, the IPGDS consists of 12 statements assessing how often participants felt preoccupation, yearning and symptoms of emotional distress over the past month because of the death of a loved one, one item assessing individuals' functional impairments following loss and one item examining perceived cultural deviations of participants' grief reactions from their community or culture. In addition, the IPGDS consists of a cultural supplement comprising 19 additional prolonged grief symptoms generated from key informant interviews with German-speaking and Chinese experts in grief and mental health (i.e. health care professionals) [47]. To derive a continuous sum score of the standard prolonged grief symptoms, we added the 12 standard items. A sum score for the standard scale (12 items) and the cultural supplement (19 items) was obtained by summing all 31 discrete symptoms. For the present study, the functional impairment and the cultural deviation criteria were not considered. Answers are given on a five-point scale ranging from 1 (*not at all*) to 5 (*always*). For a more detailed description of the IPGDS, please see [29]. Reliabilities of the German-speaking and Chinese 12-item version of the IPGDS were, $\alpha = 0.91$, and $\alpha = 0.92$, respectively. Reliabilities of the German-speaking and Chinese 31-item version of the IPGDS were, $\alpha = 0.96$, and $\alpha = 0.97$, respectively.

2.4. Statistical analyses: network analysis

A network model consists of edges and nodes [7]. Nodes represent entities such as symptoms, and edges represent the associations/correlations between the nodes. Hence, edges can have a valence (positive or negative), a weight that indicates the strength of connectedness between two nodes (ranging from −1 to 1), and a direction indicating causality in longitudinal studies. The interpretation of a network model is based on numerical indicators and visual inspection. The interpretation of the strength of connectedness between two nodes is relative to the strongest estimated edge in the data. Visually, this is indicated by the edge with the strongest weight showing the thickest line in the graph and nodes with a lower correlation showing thinner lines.

NA is a useful technique to study the importance of symptoms for the interconnectedness of a syndrome network. The importance of a symptom for a network's interconnectedness can be evaluated via relative and absolute numerical indicators. Strength centrality was used as a relative indicator for a symptom's importance for the interconnectedness of the PGD network and estimated via the R package *qgraph* [13]. It is currently the most reliable centrality index [12]. It results from the accumulation of a symptom's absolute edge weights to its connected symptoms. Symptoms with a high strength centrality contribute the most to the interconnectedness of a network by having relatively many strong associations with others. Further, a symptom's predictability was used as an absolute indicator for its interconnectedness [17] and estimated via the R package *mgm* [22]. While strength centrality implies if a symptom is relatively important for the cohesion of the symptoms of a syndrome network, predictability indicates how well a symptom can be predicted by other symptoms. The strength centrality and predictability of a node have been found to strongly correlate with each other [17]. Further, a network's average predictability is an indicator for the overall interconnectivity of a network: it indicates how well a disorder can be predicted by all the symptoms included in the network [22]. Hence, the average predictability can be seen as an indicator for how well the ICD-11 items conceptualize PGD and if additional factors need to be identified. Average predictability was, therefore, estimated for a network with only the 12 standard items and another one including the 19 additional items to indicate the predictive value of the additional items for PGD.

In order to estimate parsimonious, interpretable networks with meaningful edges, regularized partial correlation networks were jointly estimated for both language groups using *fused graphical lasso* (FGL; [8] with *k*-fold cross-validation [14] in the R package *EstimateGroupNetwork* [6]. FGL empirically identifies the most appropriate density of the German-speaking and Chinese network by taking their edge weight similarities and differences into account, and by shrinking small and spurious edges to exactly zero. This method estimates unique associations between symptoms by controlling for all other symptoms in the network. Hence, each association that is included in the final network model is meaningful independent of how strong this association is [12].

Several measures were applied to examine differences between the language groups. First, a regularized moderated network model was used as a formal test to examine how many edge weights significantly differ between the two cultural groups (at $p \leq .05$) via the R package *mgm* [21]. Second, the order of strength centrality between both networks was compared via spearman correlation [17]. Third, a joint network for German-speaking and Chinese bereaved was estimated

Table 2
Descriptive statistics for sociodemographic, loss-related and symptom characteristics in the German-speaking and Chinese sample.

Variable	German-speaking sample (n = 214)		Chinese sample (n = 325)		Total sample (N = 539)		Difference test
	M / n	*SD* / %	*M* / n	*SD* / %	*M* / n	*SD* / %	*Two-samples Wilcoxon, χ^2 or Fisher's exact test*
Age (in years) [1]	38.71	16.02	33.14	12.30	35.39	14.17	$W = 39{,}105$, $p = .002$
Gender							$p < .001$
Male	33	15.4	104	32.7	137	25.8	
Female	178	83.2	212	66.7	390	73.3	
Other	3	1.4	2	0.6	5	0.9	
Education							$p < .001$
Primary, high school, vocational education	111	52.1	61	18.9	172	32.1	
College/university	92	43.2	259	80.4	351	65.6	
Other	10	4.7	2	0.6	12	2.2	
Relationship to deceased							$\chi^2 = 74.28$, $p < .001$
Partner	35	16.4	14	4.3	49	9.1	
Child	32	15.0	9	2.8	41	7.6	
Sibling	11	5.1	10	3.1	21	3.9	
Parent	46	21.5	96	29.5	142	26.3	
Grandparent	47	22.0	143	44.0	190	35.2	
Other family member	17	7.9	33	10.2	50	9.3	
Friend	23	10.7	18	5.5	41	7.6	
Other	3	1.4	2	0.6	5	0.9	
Time since loss (in months) [2]	47.67	52.52	55.18	46.27	52.22	48.92	$W = 29{,}926$, $p = .010$
Cause of death							$\chi^2 = 42.00$, $p < .001$
Natural death	154	72.3	277	85.8	431	80.1	
Accident, drug use	20	9.4	22	6.8	42	7.8	
Suicide, murder	39	18.3	12	3.7	51	9.5	
Other	–	–	14	4.3	14	2.6	
Expectedness of death [a]	3.64	2.34	3.53	2.28	3.57	2.30	$W = 35{,}787$, $p = .558$
Prolonged grief: Standard scale (IPGDS) [b]	27.25	9.95	33.92	10.50	31.27	10.78	$t = -7.44$, $p < .001$
Prolonged grief: Standard scale + cultural supplement (IPGDS) [c]	62.08	22.85	75.03	25.51	69.89	25.27	$W = 23{,}922$, $p < .001$

Note. [1] Total: 530, German-speaking: 214, Chinese: 316; [2] Total: 537, German-speaking: 212, Chinese: 325; [a] 7-point Likert scale from 1 (not at all) to 7 (very much); [b] Score comprised of 12 standard items; [c] Score comprised of standard scale and cultural supplement. Two-samples Wilcoxon rank sum test was calculated when assumptions of normality were violated. Fisher's exact test is reported for cell counts <5.

by averaging the edge weights of both networks [17]. Finally, a network was estimated that indicates the standard deviations of all edge weights across both networks [17,38]. This variability network shows how much an edge's weight differs across both samples.

Using the R package *bootnet*, the accuracy of the estimated edge weights was tested via 95% bootstrapped confidence intervals [12]. Also, case-dropping subset bootstraps were applied to test the stability of the node's strength centralities [12]. The results of these analyses can be found in the online supplementary material.

Overall, two NAs were conducted to compare PGD symptom networks among German-speaking and Chinese participants: one with the 12 standard symptoms of the IPGDS since these form the established measure for PGD, and a second using the 12 standard and 19 additional symptoms (31-item version of the IPGDS).

2.5. Access to study data and materials

Measures, data and R scripts are publicly available on the Open Science Framework (https://osf.io/frkec/).

3. Results

3.1. Descriptive statistics

Please see Table 3 for the IPGDS items, respective short names, and means and standard deviations. The mean across all symptoms was 2.21 ($SD = 1.12$). The symptom with the highest overall mean score was yearning for the deceased (S1, $M = 3.37$). The symptom with the lowest overall mean score was pertaining to individuals' wish to die in order to be with the deceased (A11, $M = 1.53$). Among Chinese bereaved, the symptoms with the highest mean score were yearning for the deceased (S1, $M = 3.44$), preoccupation with the deceased or death (S2, $M = 3.34$) and intense feelings of sorrow (S3, $M = 3.27$). Items pertaining to loss of control over one's life (A13, $M = 1.82$), the wish to die in order to be with the deceased (A11, $M = 1.71$), and unhealthy behavior change (A3, $M = 1.67$) showed the lowest mean scores in the Chinese sample. For German-speaking participants, the symptoms with the highest mean score included yearning for the deceased (S1, $M = 3.29$), the feeling that the deceased is beside them (A17, $M = 2.84$) and intense feelings of sorrow (S3, $M = 2.78$). Loss of control over one's life (A13, $M = 1.43$), searching for the deceased (A14, $M = 1.41$), and the wish to die to in order to be with the deceased (A11, $M = 1.35$) showed the lowest mean scores. The symptom profiles of both language groups correlated by $r = 0.78$.

3.2. Network analysis of the standard ICD-11 PGD symptoms

The two samples shared many common symptom associations (see Fig. 1A and B) which was indicated by a strong correlation between the edge weights of both culture groups ($r = 0.76$). Thus, most edge weights seemed to be similar for both samples. Both language groups showed strong connections between S5-S7 (anger over the loss, blaming others or circumstances) (average edge weight = 0.35), as well as S1-S3 (yearning for the deceased, intense feelings of sorrow) (average edge weight = 0.39). They further showed similar moderate associations between S2-S8 (preoccupation with the deceased or death, not accepting the loss), S8-S9 (not accepting the loss, loss of self), S9-S10 (loss of self, inability to experience joy or satisfaction), and S10-S11-S12 (inability to experience joy or satisfaction, emotional numbness, difficulties engaging in enjoyable activities). S6 (avoidance of reminders) showed the weakest associations in both networks which was also reflected in the lowest average centrality (−1.84).

Fig. 1D also shows several considerable differences between both samples. The moderated network model that was used as a formal

Table 3
Short names of the International Prolonged Grief Disorder Scale standard and supplemental items, means and standard deviations for German-speaking and Chinese participants.

Short name	International Prolonged Grief Disorder Scale item	German-speaking sample *M* (*SD*)	Chinese sample *M* (*SD*)
Standard Items			
S1	I am longing or yearning for the deceased.	3.29 (1.09)	3.44 (1.08)
S2	I am preoccupied with thoughts about the deceased or circumstances of the death.	2.63 (1.28)	3.34 (1.09)*
S3	I have intense feelings of sorrow, related to the deceased.	2.78 (1.16)	3.27 (1.11)*
S4	I feel guilty about the death or circumstances surrounding the death.	1.94 (1.15)	2.89 (1.18)*
S5	I am angry over the loss.	2.39 (1.19)	2.49 (1.26)
S6	I try to avoid reminders of the deceased or the death as much as possible (e.g., looking at pictures).	1.85 (1.13)	2.62 (1.24)*
S7	I blame others or the circumstances for the death (e.g., doctors, a higher power).	1.69 (1.05)	2.51 (1.25)*
S8	I have trouble or just don't want to accept the loss.	2.03 (1.19)	2.97 (1.30)*
S9	I feel that I lost a part of myself.	2.59 (1.34)	3.03 (1.27)*
S10	I have trouble or have no desire to experience joy or satisfaction.	1.91 (1.18)	2.67 (1.21)*
S11	I feel emotionally numb.	2.05 (1.10)	2.38 (1.10)*
S12	I have difficulties engaging in activities I enjoyed prior to the death.	2.10 (1.17)	2.30 (1.17)
Supplementary Items[a]			
A1 (G, C)	I experience strong physical problems since the loss (e.g., headache, problems with appetite).	1.70 (1.04)	2.49 (1.00)*
A2 (G)	I would do anything to feel close to the deceased (e.g., visit their grave, sleep next to their picture).	2.49 (1.27)	2.41 (1.14)
A3 (G)	Since the loss my behavior has changed drastically in an unhealthy direction (e.g., excessive alcohol consumption).	1.54 (0.96)	1.67 (0.96)
A4 (G)	The loss shattered my trust in life or faith in a higher spiritual power.	2.11 (1.28)	2.22 (1.20)
A5 (G, C)	It is impossible for me to focus.	1.89 (1.06)	2.04 (1.05)
A6 (G, C)	My grief is so intense that I feel stuck in grief (I'm stuck in my grief).	1.72 (1.07)	2.25 (1.13)*
A7 (G)	I just can't seem to fall back into a rhythm.	1.62 (0.98)	1.97 (1.14)*
A8 (G, C)	I feel paralyzed and disconnected (e.g., as if I am not in my own body)	1.66 (1.04)	1.86 (1.05)*
A9 (G)	I have no energy or desire to engage in activities.	2.02 (1.10)	2.05 (1.16)
A10 (G, C)	This life holds no meaning since the death.	1.64 (1.12)	1.93 (1.11)*
A11 (G, C)	I want to die in order to be with the deceased.	1.35 (0.80)	1.71 (1.02)*
A12 (G)	I don't feel close to other people or feel no satisfaction when being around others.	1.74 (1.09)	1.91 (1.12)
A13 (G)	I feel like I have completely lost control over my own life.	1.43 (0.81)	1.82 (1.06)*
A14 (G, C)	I am searching for the deceased with the hope to find him/her.	1.41 (0.83)	2.11 (1.18)*
A15 (C)	I constantly look back upon the past relationship.	2.36 (1.11)	3.07 (1.17)*
A16 (C)	I feel so helpless since I lost him/her.	1.86 (1.05)	2.38 (1.22)*
A17 (C)	I feel he/she is beside me.	2.84 (1.26)	2.69 (1.21)
A18 (C)	I cry loudly when I think of the loss.	1.97 (1.04)	2.68 (1.22)*
A19 (C)	I can't trust others since the loss.	1.48 (0.95)	1.83 (1.07)*

Note. [a] Culture-specific symptoms considered important by German-speaking (G) and Chinese (C) health care professionals who served as key informants (Stelzer et al., in press) * $p < .05$.
Stelzer, E. M., Zhou, N., Merzhvynska, M., Rohner, S., Sun, H. L., Wagner, B., … Killikelly, C. (in press). Clinical utility and global applicability of prolonged grief disorder in the ICD-11 from the perspective of Chinese and German-speaking health care professionals. *Psychopathology*.
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test to identify significantly different edge weights resulted in seven (10.6%) significantly different edges between the samples. The strongest difference was found between S3 (intense feelings of sorrow) and S12 (difficulties engaging in enjoyable activities). While a moderate association was estimated between those symptoms for German-speakers (0.22), no association was found in the Chinese sample. This was also indicated by the largest standard deviation of all edges ($SD = 0.16$) in Fig. 1D. Furthermore, a relatively weak association emerged between S6 (avoid of reminders) and S7 (blaming others or circumstances) for Chinese, which was not corroborated in the German-speaking sample. Also, whereas no association was found between S2 (preoccupation with the deceased or death) and S5 (anger over the loss) for German-speaking participants, a negative association was found between these two symptoms for Chinese participants.

Fig. 2 shows the strength centrality profiles of the German-speaking and Chinese as well as the cross-culture network. The strength centrality profiles of both language groups showed a rather strong correlation of $r = 0.67$. The symptoms with the highest strength centralities in both language groups were S3 (intense feelings of sorrow) and S10 (inability to experience joy or satisfaction), while S6 (avoidance of reminders), S4 (feelings of guilt about death) and S11 (emotional numbness) showed the lowest strength centralities for each language group and on average. The largest differences in strength centrality between both language groups were found for S2 (preoccupation with the deceased or death) and S12 (difficulties engaging in enjoyable activities). Preoccupation with the deceased or death was the second most central symptom for Chinese participants, while it was the fourth least central for German-speakers. In contrast, difficulties engaging in enjoyable activities was a moderately central symptom in the German-speaking sample but the third least central in the Chinese.

Further, the average predictability of each network was similar between German-speaking ($R^2 = 0.49$) and Chinese bereaved ($R^2 = 0.54$) indicating that overall 51.5% of the variance of each symptom could be explained by its connected symptoms. Predictability and strength centrality were highly related within each network ($r_{\text{German-speaking}} = 0.75$, $r_{\text{China}} = 0.82$) indicating that a strong central symptom also seemed to be highly predictable and influential through its connected symptoms.

3.3. Network analysis of the standard ICD-11 PGD and the supplementary symptoms

Including the 19 additional items, both samples still showed many similarities in their network structure (see Fig. 3A and B) which was indicated by a strong correlation between the edge weights of both cultural groups ($r = 0.72$). Both samples showed strong connections between S5-S7 (anger over loss, blaming others or circumstances) (average edge weight = 0.31), S1-S3 (yearning for the deceased,

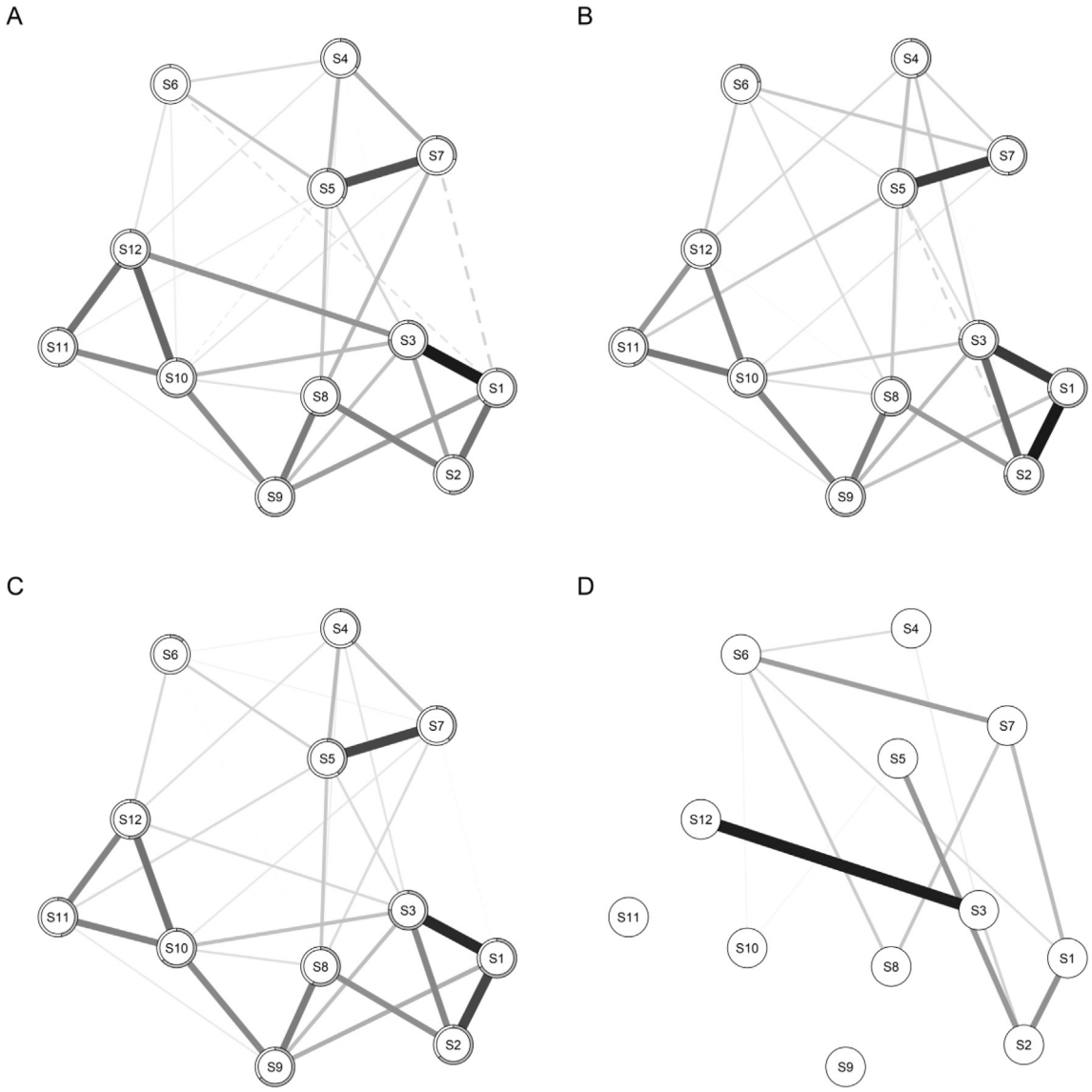

Fig. 1. (A) Estimated network for German-speaking participants. (B) Estimated network for Chinese participants. (C) Estimated joint network showing average edge weights and predictabilities across both language groups (cross-culture network). Edge thickness indicates edge weight, solid edges indicate positive relations, dashed edges negative relations between symptoms. The thicker the edge, the stronger the association between two symptoms. Grey area in the ring around a node indicates its predictability (explained variance of a symptom by its connected symptoms). (D) Variability network that shows the standard deviation of each edge across both samples. The thicker the edge, the higher the difference between both samples. S1-S12 = standard 12 IPGDS items.

intense feelings of sorrow) (average edge weight = 0.30), A10-A11 (life holds no meaning, wish to die in order to be with deceased) (average edge weight = 0.25), and A12-A13 (not feeling close to others or no satisfaction being around others, loss of control over one's life) (average edge weight = 0.28). S11 (emotional numbness) showed the weakest associations in both networks which is also reflected in the lowest average centrality (−1.50).

However, Fig. 3D also shows several considerable differences between both samples. The moderated network model resulted in eleven (2%) significantly different edges between the samples. The strongest difference was found between A11 (wish to die in order to be with deceased) and A14 (searching for the deceased). Whereas no association was estimated between those symptoms for German-speakers (Fig. 3A), a strong association was found in the Chinese sample (Fig. 3B). This was also indicated by the largest standard deviation of all edges ($SD = 0.2$) in Fig. 3D. Further, the second largest standard deviation of 0.14 indicated language group specific associations between S6 (avoidance of reminders) and A2 (doing anything to feel close to deceased). A negative association was estimated between these symptoms for German-speakers, but no association was found for Chinese bereaved. Last, while a moderate association was found between S12 (difficulties engaging in enjoyable activities) and A10 (life holds no meaning) among German-speaking bereaved, no association was found for Chinese participants.

Fig. 4 shows the strength centrality profiles of each language group and the cross-culture network. Including the culture-sensitive, supplementary symptoms, the strength centrality profiles of both language groups showed a lower correlation ($r = 0.66$) compared to the network with only the 12 standard items. As can be seen in Fig. 4, the two samples showed several additional differences especially in the added items. The most central symptoms for German-speaking bereaved were S3 (intense feelings sorrow), A11 (wish to die in order to be with deceased) and A10 (life holds no meaning), and for Chinese bereaved A3 (unhealthy behavior change), S3 (intense feelings of sorrow) and S1 (yearning for the deceased). On average, the most central symptoms were S3 (intense feelings of sorrow), S1 (yearning for the deceased) and

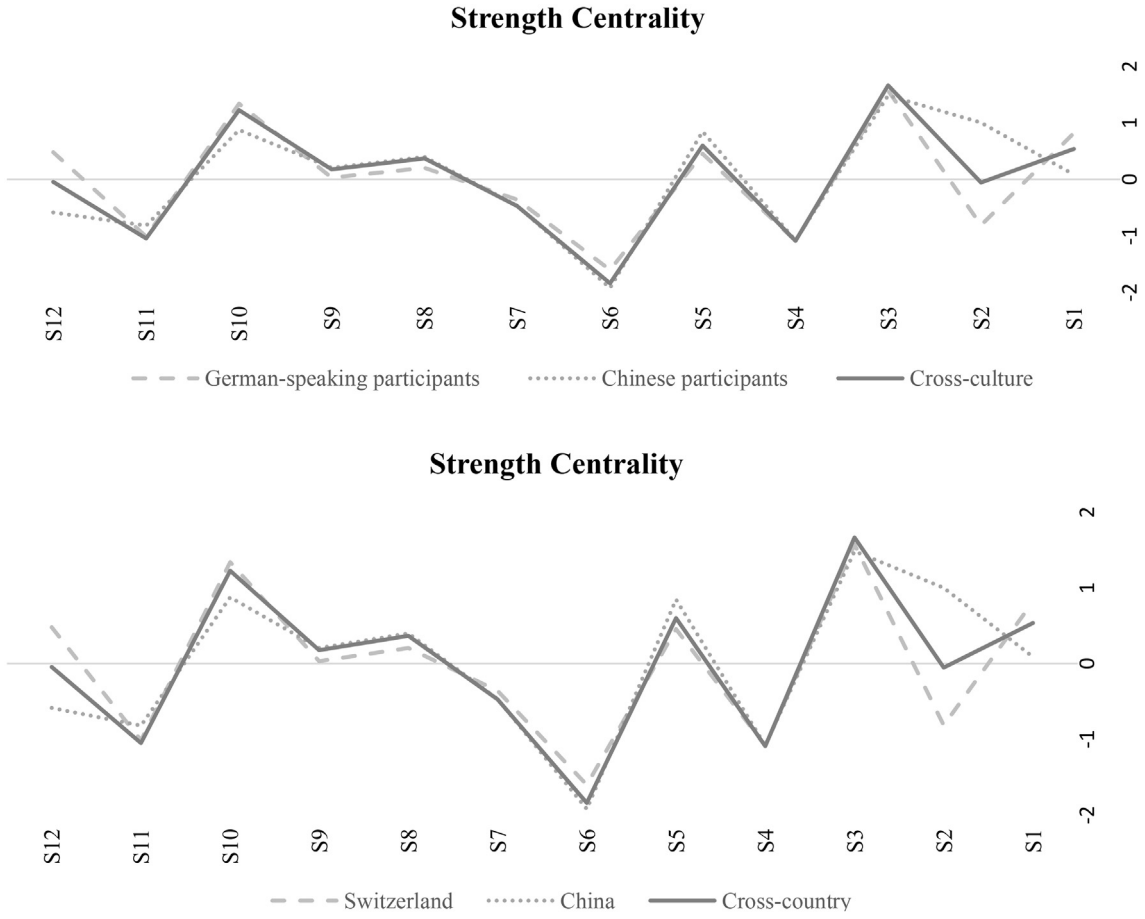

Fig. 2. Standardized node strength centrality for both samples and the joint sample. S1-S12 = standard 12 IPGDS items.

A3 (unhealthy behavior change). The least central symptoms for German-speaking participants were S7 (blaming others or circumstances), A14 (searching for the deceased) and S11 (emotional numbness). For Chinese participants, the symptoms with fewest associations were S6 (avoidance of reminders), S4 (feelings of guilt about death) and S12 (difficulties engaging in enjoyable activities). On average, S11 (emotional numbness), S7 (blaming others or circumstances) and A4 (shattered trust in life or faith in higher spiritual power) were the least central symptoms.

Further, the average predictability was similar between the German-speaking ($R^2 = 0.49$) and Chinese network ($R^2 = 0.58$) indicating that overall 53.5% of the variance of each symptom could be explained by its connected symptoms. Predictability and strength centrality were moderately related within each network ($r_{\text{German-speaking}} = 0.51$, $r_{\text{China}} = 0.67$).

4. Discussion

PGD presents a novel diagnostic entity in the ICD-11 and its criteria are conceptualized following the WHO's prioritization of global applicability. So far, no study applying NA in bereavement has used the official ICD-11 criteria and contrasted findings for different cultural groups. The current study addressed these limitations by conducting two NAs to compare the symptom structure of ICD-11 PGD networks among German-speaking and Chinese bereaved: one with 12 symptoms since these form the established measure for ICD-11 PGD (standard scale), and a second one using the 12 standard and 19 additional, culturally relevant symptoms (supplementary scale). This network approach allowed us to examine the network structure of the new ICD-11 PGD diagnosis in order to identify the most central symptoms, to explore if the PGD network can be enhanced by adding culturally relevant supplementary items, and to assess the generalizability of ICD-11 PGD networks across two samples.

4.1. Central symptoms in the standard ICD-11 PGD networks

Our first research question examined symptom associations and centralities of the new ICD-11 PDG syndrome. Intense feelings of sorrow and inability to experience joy or satisfaction had the strongest overall associations (as indexed by strength centrality) in both language groups. These results add to existing network findings showing that symptoms related to emotional pain, and not yearning, are most central to the clinical syndromes of grief [31,32,39]. At the same time, our findings enhance the specificity of PGD criteria by identifying specific emotional pain items that have strong associations with other PGD symptoms. That feelings of intense sorrow and inability to experience joy or satisfaction emerged as most central to the networks suggest that symptoms related to depressive affect may be an important target for grief-specific treatments. Interestingly, German health-care providers considered feelings of intense sorrow as too generic and with little discriminant power to distinguish between PGD and non-PGD cases [47]. Even though yearning did not emerge as a central node in the standard ICD-11 PGD networks, there is reason to believe that it nevertheless constitutes an important symptom. This is suggested by its high endorsement rates across language groups, the strong link between yearning and feelings of sorrow as well as the centrality of yearning once the culture-sensitive supplemental items were included. One possibility is that yearning may activate other PGD symptoms and thereby

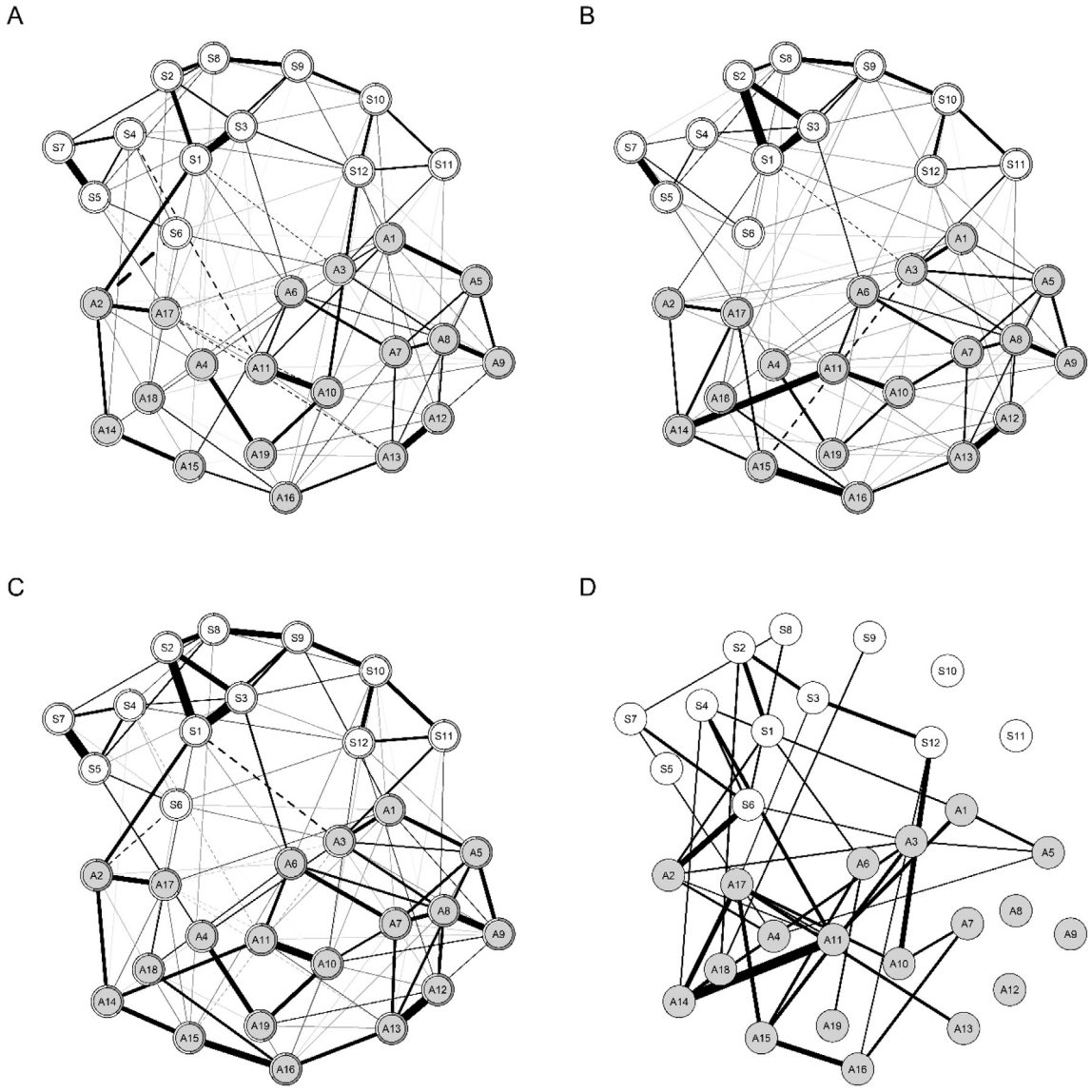

Fig. 3. (A) Estimated network for German-speaking participants. (B) Estimated network for Chinese participants. (C) Estimated joint network showing average edge weights and predictabilities across both language groups (cross-culture network). Edge thickness indicates edge weight, solid edges indicate positive relations, dashed edges negative relations between symptoms. The thicker the edge, the stronger the association between two symptoms. Grey area in the ring around a node indicates its predictability (explained variance of a symptom by its connected symptoms). (D) Variability network that shows the standard deviation of each edge across both samples. The thicker the edge, the higher the difference between both samples. S1-S12 = standard 12 IPGDS items (white circles). A1-A19 = additional 19 items (grey circles).

serve as a gateway to the manifestation of other symptoms [35], whereas symptoms related to emotional pain may be central because they are activated by many other nodes rather than being a cause of activation. Overall, the finding that two emotional pain items emerged as central nodes is consistent with the assumption that emotional pain symptoms are core features of distress-related syndromes [31] and confirms the current conceptualization of PGD in the ICD-11. Diagnostic criteria for DSM-5 PCBD, in contrast, do not mandate that emotional pain symptoms are present even though our results clearly suggest that symptoms pertaining to emotional pain hold the PGD network together.

Peripheral symptoms of the ICD-11 PGD syndrome included avoidance of reminders of the deceased or death, guilt about death and emotional numbness. Previous NAs also found avoidance to be among the least connected nodes within grief networks [32,39], despite its hypothesized importance by cognitive-behavioral models of grief [4]. As we discuss later, this does not necessarily mean that such features of emotion dysregulation should not be part of the PGD syndrome. The centrality index indicates the interconnectedness of symptoms and does not necessarily reflect the theoretical or clinical importance of a symptom. Thus, even though avoidance of reminders had a low centrality, it may still be an essential node in the PGD network.

4.2. Supplementary, culturally relevant PGD symptoms

Our second research question explored if any of the culturally relevant supplement criteria enhance the network of PGD symptoms among German-speaking and Chinese bereaved. Compared to the standard PGD network, the expanded network showed a better average predictability for Chinese participants, but no improvement for the German-speaking context. This suggests that the current conceptualization of the ICD-11 PGD syndrome does not fully capture the range of grief reactions endorsed by Chinese bereaved and that diagnostic criteria could be improved by adding culturally-bound symptoms. For German-speaking bereaved, in contrast, the 12 standard symptoms

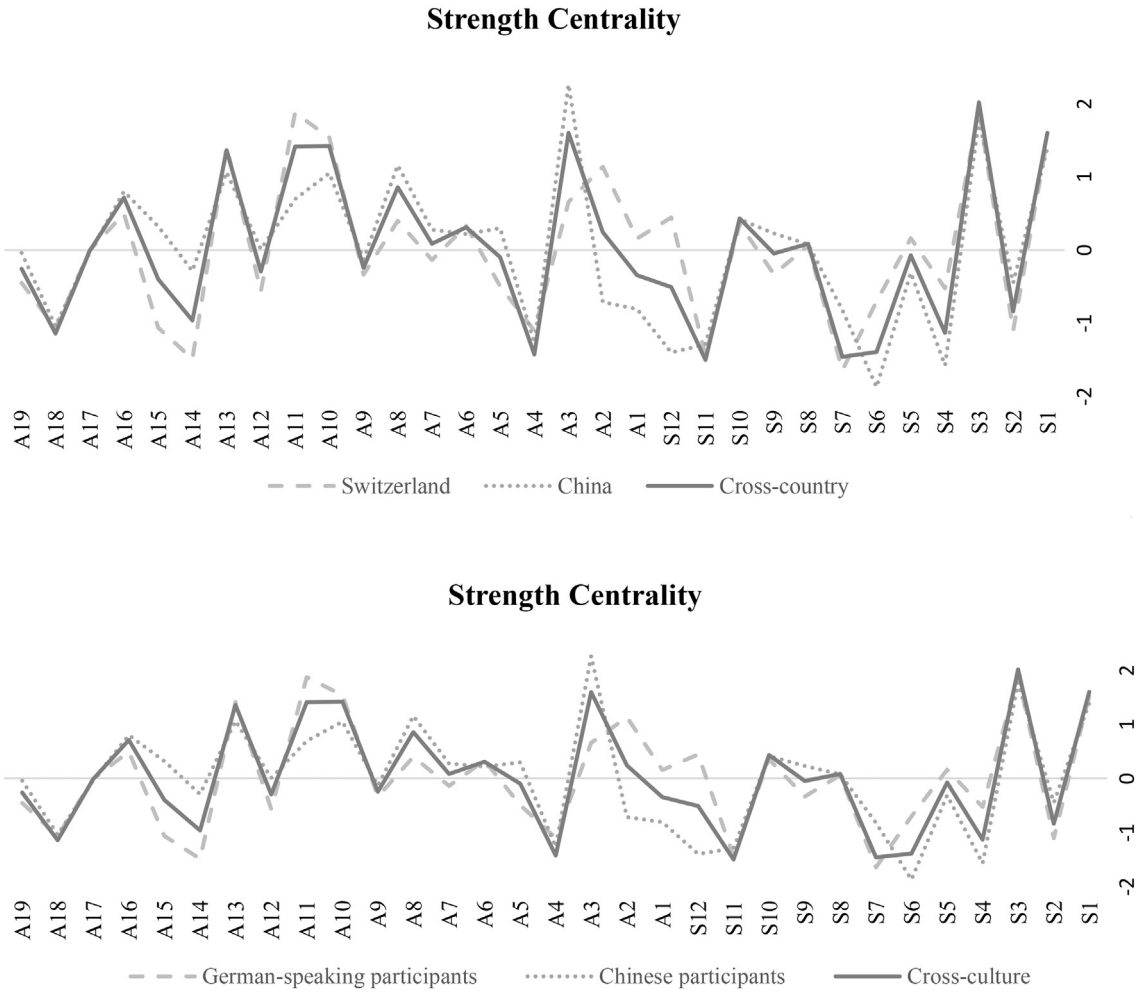

Fig. 4. Standardized node strength centrality for both samples and the joint sample. S1-S12 = standard 12 IPGDS items. A1-A19 = additional 19 items.

seem to accurately resemble grief responses, an expected finding given that the current ICD-11 criteria were drafted predominantly based on research findings from the Global North. Additional cultural symptoms did not improve the predictability for German-speaking networks. Overall, these findings add to the increasing literature on cross-cultural variations in grief and highlight the need to consider culturally-bound symptoms and grief correlates when assessing grief reactions in cultural groups beyond the Global North [26,41,46,47]. The newly validated IPGDS serves as a self-report tool which enables a more culturally-sensitive assessment of grief reactions. The cultural supplement of the IPGDS, which was developed following key informant interviews with Chinese and German-speaking health-care providers [47], includes a wider range of symptoms hypothesized to have a unique bearing on grief manifestations in different cultural settings, but currently not part of the official ICD-11 PGD criteria. As shown in the present study, such additional, culturally relevant symptoms can enhance the predictability for Chinese bereaved, which may also be the case for other cultural contexts. Future research should investigate the validity of the current ICD-11 PGD symptoms and the potential benefit of including culture-specific items across different contexts. Considering culture-specific grief symptoms, correlates and consequences of bereavement can further inform initiatives such as the Global Clinical Practice Network and their guidelines for screening. Killikelly et al. [29] outline how to use the standard and cultural supplement of the IPGDS in a clinical setting in order to ensure a more in-depth assessment of grief symptoms.

The added symptoms also resulted in changes in symptom associations and strength centralities. Compared to the network comprised of standard items, individuals' inability to experience joy or satisfaction was no longer among the most central symptoms whereas feelings of sorrow still indexed high strength centrality when additional symptoms were included. In the Chinese PGD network, unhealthy behavior change emerged as the symptom with most associations, followed by intense feelings of sorrow and yearning. For German-speaking participants, intense sorrow remained the most central symptom, followed by the wish to die in order to be with the deceased and the perception that life holds no meaning without the deceased. If one assumes that measures of centrality imply clinical relevance, then our findings suggest different therapeutic targets based on individuals' cultural background. Whereas dysfunctional behaviors and separation-related distress (i.e. yearning) may be important to target in the Chinese cultural context, depressive features might be integral variables for change among German-speakers. One possible explanation is that German-speaking and Chinese bereaved individuals differ in their grief expression. As such, it could be that Chinese individuals are less likely to openly express and report intense sorrow or depressive affect compared to German-speakers and instead show unhealthy behavior habits (e.g., drinking) or physical maladjustments. In separate analyses of this same data set, we found that German-speaking bereaved people indeed expressed more grief and also believed that grievers should express their painful emotions more openly whereas Chinese bereaved were more likely to conceal their grief. Similarly, Xiu et al. [50] found

Chinese bereaved parents reported more functional impairments than Swiss bereaved parents. So far, maladaptive health behaviors are not included as part of the ICD-11 PGD diagnostic criteria even though difficulties engaging in self-care behaviors (e.g., involuntary weight loss, impaired sleep quality or increased alcohol consumption) are documented following the death of a loved one [45]. Yearning, in contrast, is already a defining symptom of the ICD-11 PGD diagnostic criteria and has been found to be the most common response to loss in the first two years of bereavement [33]. Recent research suggests that yearning is a cognitive-affective process whereby the bereaved repetitively compares the present with an alternative but unattainable reality and has the desire to seek proximity to the deceased [11], two aspects assumed to play an important role in the development and maintenance of PGD [1,44]. Based on this view, treatments in which clients are asked to engage in self-care and to approach avoided aspects of the loss should be particularly effective in treating PGD in Chinese bereaved. German-speaking bereaved (and to a somewhat lesser extent Chinese bereaved) may benefit more strongly from treatments that focus on their depressive affect. The importance to address depressive symptoms during bereavement is further highlighted by the link between individuals' perception that life holds no meaning without the deceased and their wish to die in order to be with the deceased as well as the association between perceived loss of control and the inability to feel close to others or to derive satisfaction from contact with others.

4.3. Generalizability of ICD-11 PGD networks across language groups

Our third aim explored whether the ICD-11 PGD network can be generalized across cultures. Findings from our NA suggest both similarities and differences in symptom associations and symptom centralities between cultural groups. This was true for both the standard ICD-11 PGD symptoms as well as supplemental scale. The most pronounced similarities in ICD-11 PGD networks included the association between symptoms of separation-related distress (i.e. yearning for the deceased and intense sorrow over the loss), as well as the link between traumatic distress reactions (i.e., anger over the loss and blaming others or circumstances for the death). In addition, depressive features (i.e. intense feelings of sorrow; inability to experience joy or satisfaction) were the most connected nodes for both Chinese and German-speaking bereaved, whereas some symptoms related to emotion regulation (avoidance of reminders, guilt, emotional numbness) were peripheral in both networks.

More interestingly are the differences that emerged between language groups. Pronounced differences between Chinese and German-speaking bereaved included the link between intense feelings of sorrow and difficulties engaging in enjoyable activities. Here, positive associations only emerged for the German-speaking sample. In contrast, a negative association emerged between preoccupation with the deceased or death and anger over the loss for Chinese bereaved only. Some differences also emerged in centrality indices. For instance, preoccupation with the deceased or death was the second most central symptom for Chinese participants, but one of the least central symptoms for German-speaking participants while the opposite was true for difficulties engaging in enjoyable activities. These associations once again indicate that problems related to depressive affect may be more pronounced among German-speaking participants. In the Chinese context, in contrast, depressive affect may be better captured by somatic symptoms. Overall, the current study provides evidence that there are both similarities and language group specific patterns between the network relationships across language groups. Thus, our results provide evidence for the cultural applicability of grief symptoms as proposed by the ICD-11 [49], while highlighting the existence of cultural variations in grief symptoms and therefore the need to consider culture-specific symptoms and culture-specific relationships among grief symptoms [20].

4.4. Limitations, strengths and future directions

The present study is the first study to explore PGD networks using the officially published ICD-11 PGD symptom criteria and to contrast networks of German-speaking and Chinese bereaved. In addition, it is the first study to index PGD using a newly developed and validated self-report measure specifically designed to reflect the ICD-11 PGD criteria. Previous NAs have used draft versions of the ICD-11 PGD criteria and existing self-report measures to assess the proposed PGD criteria even though items often did not correspond to the official ICD-11 PGD criteria [31]. In addition, this study extends previous network modeling of PGD by including additional, culture-specific nodes beyond the symptoms specified in the ICD-11 diagnosis. Whereas it is possible that some of the nodes in the network of standard and supplemental items represent the same semantic cluster (e.g., yearning for the deceased – searching for the deceased) rather than the interaction of otherwise independent constructs, the current study presents a novel attempt to move towards a more cultural-sensitive understanding of prolonged grief. More recently, researchers have been calling to consider additional symptoms that may be relevant to the development and maintenance of PGD (e.g., [35,46]. The present NA includes additional nodes or symptoms considered to be theoretically and practically meaningful by health care providers from both cultural contexts [47], and our analyses confirmed that these supplementary symptoms can indeed add predictive power.

Despite its advantages, the study comes with limitations. Subjects were recruited via convenience sampling (recruited from the community and participation in the study was voluntary) and thus may overrepresent well-adjusted bereaved individuals. In addition, our study used self-report measures. This may have added to the low centrality of avoidance, a symptom which can be more adequately captured through clinical interviews with observations shared by clinicians but is difficult to assess through self-report. Furthermore, sociodemographic, loss characteristics (e.g., time since loss) and overall levels of grief symptoms differed between German-speaking and Chinese participants. Such differences between participant groups restrict sample representativeness and may have impacted network relationships. Additionally, the current sample is non-clinical and bereavement happened approximately four years ago, which may have resulted in specific networks of grief psychopathology different from symptom networks that may be found during the acute phase of bereavement. A future analysis should examine which items improve the centrality of the 'core' symptoms, particular in a clinical sample. It could be that 'core' symptoms such as longing for the deceased or preoccupation with the deceased may be different depending on 1) the cultural context and 2) the severity of the grief reaction. The current sample is non-clinical and therefore the 'core symptoms' may not be as central as would be in a clinical sample. Most important, the cross-sectional nature of this study precludes any causal interpretations of symptom relationships. As such, caution is warranted when interpreting a node's centrality since edges between nodes are undirected [17]. This means that it is not certain how much a node causally influences other nodes and how much that node is influenced by others, or even if feedback loops might exist between them. Future research should employ longitudinal studies or experimental manipulations to draw conclusions regarding causality. In addition, larger sample sizes are necessary given that the power of reliability estimate networks is impacted by the number of nodes and sample size. In the absence of clear guidelines, a proposed rule of thumb suggests three participants per estimated parameter [16]. Thus, our sample would be relatively small for the standard PGD network and even more so for the combined symptom network.

4.5. Implications

The major advantage of a network approach is that it identifies influential nodes or symptoms within a network and thereby points to

specific symptoms and symptom relations that can be modified to change the functioning of the network, and to reduce or increase activation of other nodes. Across both cultural groups, emotional pain symptoms related to depressive affect (i.e. feelings of intense sorrow, inability to experience joy or satisfaction) were identified as central symptoms. This is especially relevant given the high comorbidity rates between PGD and depression [23]. Treatment for complicated grief and interpersonal psychotherapy for grief-related depression target symptoms such as loss of interest [43]. Previous research demonstrated that grief-related depressive symptoms need to be addressed together with symptoms of complicated grief in order to reduce intense grief [19]. Complicated grief treatment is a targeted treatment which integrates elements from interpersonal psychotherapy for grief-related depression as well as cognitive-behavioral therapy-based techniques for addressing trauma symptoms such as avoidance behaviors and loss symptoms such as yearning for the deceased. Furthermore, the investigation of additional nodes/symptoms highlights the potential benefit of culture-specific treatment targets. In the Chinese context, it may be worthwhile to target health behaviors and focus on symptoms related to separation-distress, whereas behaviors related to depressive affect may be more important for German-speaking individuals. Nevertheless, we want to emphasize that centrality does not automatically translate to clinical relevance and highly central symptoms are not automatically viable intervention targets. As highlighted by Fried et al. [17], there are different reasons why symptoms may emerge as central in a network work. For example, a symptom may be central since they are the causal endpoint for many pathways or since it features feedback loops. Longitudinal or experimental designs are necessary to formally test causal directions.

5. Conclusion

Based on research evidence suggesting that symptoms of prolonged or complicated grief differ between cultures, the present study investigated and contrasted network structures of PGD criteria in German-speaking and Chinese bereaved. Network structures were examined and contrasted for the official ICD-11 PGD criteria as well as for diagnostic criteria supplemented by culturally-bound symptoms hypothesized to be of relevance in the respective cultural contexts. We found similarities and differences in network structures between cultural groups. Intense feelings of sorrow and inability to experience joy or satisfaction since the death emerged as most central symptoms for both German-speaking and Chinese bereaved, whereas avoidance related to death or reminders of the deceased were relatively peripheral. Results further suggest there are culturally-bound symptoms of grief that are currently not included in the official ICD-11 PGD criteria but should find consideration in order to develop more specific diagnostic criteria, to enhance clinical care, and to establish global applicability.

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Ethical standards

The authors assert that all procedures contributing to this work comply with the ethical standards of the relevant national and institutional committees on human experimentation and with the Helsinki Declaration of 1975, as revised in 2008.

Declaration of Competing Interest

None.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.comppsych.2020.152211.

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